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WATER QUALITY SURVEY IN THE SHENANDOAH RIVER OF THE POTOMAC RIVER BASIN, JUNE 1967

Federal Water Pollution Control Administration
Annapolis, Maryland

April 1968

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Springfield VA 22151

CB-SEMP Working Document Number 25
Chesapeake Field Station
FWPCA
Middle Atlantic Region
April 1968

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I. INTRODUCTION

The Chesapeake Field Station of the Middle Atlantic Region, Federal Water Pollution Control Administration, conducted an intensive survey of the Shenandoah River Basin during June 1967. Separate surveys were made on (1) the Main Stem of the Shenandoah River, (2) the South Fork of the Shenandoah River, including the South River and the Middle River, and (3) the North Fork of the Shenandoah River (see Figure 1). The report is a summary of the data collected on these surveys.

The purposes of these surveys were to aid in verifying the DO and BOD model parameters and to determine general water quality. The survey should also show the extent of any diurnal quality fluctuations.

II. PROCEDURE

A. Sampling

1. All samples for chemical analysis were obtained by dipping a plastic container full of the shallow stream water. A quart cubitainer was then filled from the dipped sample and iced. A portion of the dipped sample was siphoned into a DO bottle until overflowing and fixed. A portion of the dipped sample was also used to measure the pH and temperature at the time of sampling. The iced samples were returned to the camper laboratory within two hours where the analyses were started immediately.

2. All bacteriological samples were obtained by dipping a sterile sample bottle directly into the stream. The full bacteriological sample bottle was then capped and iced.

B. Chemical Analysis

1. Dissolved Oxygen

Reference: Standard Methods for the Examination of Water and Wastewater, 12 ed., 1965.

Dissolved oxygen was determined by the azide modification of the basic Winkler method with the titration done potentiometrically with an automatic TITRALYZER.

2. Biochemical Oxygen Demand

Reference: Standard Methods for the Examination of Water and Wastewater, 12 ed., 1965.

The biochemical oxygen demand was determined by the azide modification of the basic Winkler method with the titration done potentiometrically with an automatic TITRALYZER. The samples, as received, were diluted if necessary and transferred to standard 300 ml BOD bottles in triplicate. One initial DO and two final DO determinations were used throughout. Incubation was started immediately at 20°C and continued for five days after which they were titrated.

3. pH

The pH measurements were made with a field pH meter.

C. Bacteriological Analysis

1. Coliform

Reference: Standard Methods for the Examination of Water and Wastewater, 12 ed., 1965.

The water samples were inoculated into fermentation tubes containing 10 ml of lauryl sulfate tryptose using decimal dilutions of one ml. Five fermentation tubes were used for each dilution and four dilutions were made. The production of gas in any amount in the inner fermentation tubes after 24 and 48 hours of incubation at 25° ± 0.5°C constituted a positive presumptive MPN test.

All positive presumptive tubes were submitted to the confirmatory test using tubes containing 10 ml of brilliant green lactose bile broth. Incubation was done for a period of 48 hours

at 35° ± 0.5°C. The production of gas in any amount in the inner fermentation tubes constituted a positive confirmed MPN test.

2. Fecal Coliform

Reference: Standard Methods for the Examination of Water and Wastewater, 12 ed., 1965.

All positive presumptive tubes from the coliform test were submitted to the confirmatory test for fecal coliform using tubes containing 10 ml of EC media. Incubation was done for a period of 24 hours at 45.5° ± 0.5°C. The production of gas in any amount in the inner fermentation tubes constituted a positive confirmed MPN test.

III. STATION DESCRIPTIONS

Number	Station	Location
M - 0	Main Stem Shenandoah	PEPCO Dam (before spillway)
M - 1	Main Stem Shenandoah	Rt. 624 Bridge north of Front Royal
M - 1 A	Main Stem Shenandoah	Rt. U. S. 50 Bridge
M - 2	Main Stem Shenandoah	Rt. 7 Bridge east of Berryville
M - 3	Main Stem Shenandoah	Rt. 9 Bridge east of Bloomery
M - 4	Main Stem Shenandoah	Rt. U. S. 240 Bridge south of Harpers Ferry
S - 1	South River	Chesmut Ave. Bridge in Waynesboro
S - 3	South River	Rt. 611 Bridge near Coiners Mill
S - 3 A	South River	Bridge in Harriston off U. S. 340
S - 4	South River	Rt. 629 Bridge in Port Republic
S - 4 A	Middle River	Rt. 629 Bridge in Port Republic
S - 6	Middle River	Rt. 256 Bridge west of Grottoes
S - 6 A	Middle River	Rt. 668 Bridge west of Grottoes
S - 8	Grassy Creek (Black Run)	Rt. 867 Bridge east of Mt. Crawford
S - 9	North River	Rt. U. S. 11 Bridge south of Mt. Crawford
S - 9 B	North River	Rt. U. S. 276 Bridge in Rockland Mill
S - 10	South Fork Shenandoah	Rt. 659 Bridge north of Grottoes
S - 11	South Fork Shenandoah	Rt. 649 Bridge east of McGaheysville
S - 12	South Fork Shenandoah	Rt. U. S. 33 Bridge west of Elkton
S - 13	South Fork Shenandoah	Rt. 602 Bridge west of Shenandoah

Number	Station	Location
S - 19	South Fork Shenandoah	Luray Ave. Bridge in Front Royal
S - 20	South Fork Shenandoah	Rt. U. S. 340 Bridge in Front Royal
N - 1	North Fork Shenandoah	Rt. 259 Bridge near Cootes Store
N - 1 A	North Fork Shenandoah	Bridge off Rt. 259 in Broadway
N - 2	North Fork Shenandoah	Rt. 42 Bridge in Timberville
N - 2 A	North Fork Shenandoah	Bridge off Rt. 260 near New Market
N - 2 B	Smith Creek	Bridge off U. S. 11 about 0.5 mile north of Rudes Hill
N - 3	North Fork Shenandoah	Rt. 767 Bridge east of Quicksburg
N - 3 A	Stony River	Bridge off U. S. 11 in Edinburg
N - 3 B	North Fork Shenandoah	Bridge off U. S. 11 two miles below Edinburg
N - 4	North Fork Shenandoah	Rt. 663 Bridge northeast of Woodstock
N - 5	North Fork Shenandoah	Rt. 55 Bridge east of Strasburg
N - 6	North Fork Shenandoah	Rt. U. S. 340 Bridge in Front Royal
N - 7	Passage Creek	Rt. 55 Bridge west of Front Royal

IV. SURVEY RESULTS

SHENANDOAH RIVER SURVEY - 1967

Sample Number	Date Sample Taken	Time Sample Taken	Temp °C	Flow CFS	BOD mg/l	DO mg/l	Coliform MPN	Fecal Coliform MPN
		Station M-0 Main Stem - PEPCO Dam (before spillway)						
67061420	6-14	1345	28		7.54	10.11	170	<20
32		1930	27.5		8.60	11.36	330	<20
41		0020	26.5		11.35	9.38	170	<20
1506	6-15	0440	24		7.39	8.40	330	<20
15		0952	27		7.82	9.08		
25		1500	27.5		9.39	10.46		
34		2030	29		10.69	12.90		
1606	6-16	0048	27		8.33	10.15		
15		0529	27		7.41	8.52		
		Station M-1 Main Stem - Bridge 624 - North of Front Royal						
67061421	6-14	1300	27		6.17	8.21	50	20
31		1955	27.5		7.96	11.34	40	<20
42		0045	26		10.73	6.25	70	<20
1507	6-15	0420	25		7.38	5.22	80	<20
16		0930	26.5		8.39	6.57		
26		1520	29.5		9.39	11.79		
35		2100	28		10.28	8.61		
1607	6-16	0029	26.5		7.55	5.99		
16		0507	26.5		6.79	5.36		

Sample Number	Date Sample Taken	Time Sample Taken	Temp °C	Flow CFS	BOD mg/l	DO mg/l	Coliform MPN	Fecal Coliform MPN
		Station M-1A Main Stem - Bridge U.S. 50						
67061412	6-14	0835	25.5		8.62	7.27	130	<20
22		1515	26.5		9.59	9.82	490	<20
33		2030	27		10.99	10.74	110	<20
43		0130	25		10.85	9.01	170	<20
1508	6-15	0615	24.5		8.58	6.85	4900	700
17		1110	26		9.06	8.53		
27		1555	28		9.89	9.64		
36		2135	28		11.34	10.30		
1608	6-16	0210	27		7.14	8.53		
17		0642	26		8.00	6.64		
		Station M-2 Main Stem - Bridge Va. 7 - East of Berryville						
67061413	6-14	0930	24.5		8.24	5.69	50	<20
23		1540	27		9.63	10.64	80	<20
34		2105	26		10.48	10.30	170	<20
44		0155	25		10.51	7.29	60	<20
1509	6-15	0642	24.5		7.88	5.93	1090	<20
18		1135	27		7.77	8.88		
28		1645	29		9.68	11.20		
37		2215	28		10.82	9.22		
1609	6-16	0244	27		9.18	6.90		
18		0709	25		5.92	5.64		

Sample Number	Date Sample Taken	Time Sample Taken	Temp °C	Flow CFS	BOD mg/l	DO mg/l	Coliform MPN	Fecal Coliform MPN
		Station M-3 Main Stem - Bridge Va. 9 - East of Blcomery						
67061414	6-14	1000	25		5.93	5.01	700	<20
24		-	27		7.40	9.82	130	<20
35		2145	27		9.87	9.16	9180	<20
45		0230	25		9.36	6.51	560	<20
1510	6-15	0725	24		7.12	5.93	270	40
29		1720	28.5		8.88	11.30		
38		2250	28		10.84	8.32		
1610	6-16	0327	25.5		7.70	6.58		
19		0740	25		5.24	5.15		
		Station M-4 Main Stem - Bridge U.S. 340 - South of Harpers Ferry						
67061415	6-14	1025	24		8.25	6.81	490	50
1620	6-16	0803	25.5		4.25	6.36		
		Station S-1 South River - Bridge Cheanut Ave - Waynesboro						
67062609	6-21	-	25	47	7.28	3.85	790	330
31		2015	23.5		2.30	8.06	2210	1300
09A	6-22	0545	24.5	48	7.12	2.40	1720	460
31A		1530	23		3.54	7.96		
09B	6-23	0115	-	64	2.48	7.93		

SHENANDOAH RIVER SURVEY (Continued)

Sample Number	Date Sample Taken	Time Sample Taken	Temp °C	Flow CFS	BOD mg/l	DO mg/l	Coliform MPN	Fecal Coliform MPN
		Station S-3 South River - Bridge Rt 611 - off U.S. 340						
67062608	6-21	-	23		11.34	2.35	3100	790
22		1448	25		14.08	5.12	1090	330
30		1940	25		8.26	3.28	490	230
44		0040	24		11.72	2.11	3480	40
08A	6-22	0520	24		8.84	1.30	2100	460
22A		0955	23.5		7.34	2.45		
30A		1505	26		11.50	3.49		
44A		1942	24		14.10	1.86		
08B	6-23	0055	-		11.64	1.42		
22B		0610	23		5.54	1.69		
		Station S-3A South River - Bridge off U.S. 340 - Harriston						
67062607	6-21	-	24		5.62	6.95	10,900	2210
21		1430	26		5.12	8.65	5420	110
29		1915	25		4.20	7.53	340	220
43		0030	24		5.08	5.63	340	80
07A	6-22	0510	23		16.00	4.65	940	460
21A		0940	23		3.48	6.03		
29A		1455	25		5.98	8.93		
43A		1931	24.5		5.68	6.11		
07B	6-23	0045	-		6.28	5.06		
21B		0600	23		5.12	4.85		

Sample Number	Date Sample Taken	Time Sample Taken	Temp °C	Flow CFS	BOD mg/l	DO mg/l	Coliform MPN	Fecal Coliform MPN
Station S-4 South River - Bridge Rt. 629 - Port Republic								
67062605	6-21	-	21		5.48	7.63	790	790
19		1353	26		5.86	9.58	790	120
27		1840	25.5		4.20	9.51	1720	460
41		2400	23		4.30	7.22	2100	50
05A	6-22	0445	23		4.04	6.38	2400	490
19A		0915	23.5		3.14	7.39		
27A		2232	26		5.10	9.17		
41A		1916	24		9.30	6.97		
05B	6-23	0010	-		5.26	6.59		
19B		0540	23		3.56	6.47		
Station S-4A Middle River - Bridge Rt. 629 - Port Republic								
67062606	6-21	-	22		4.62	6.95	790	230
20		1356	26		2.82	8.40	490	80
28		1905	25.5		1.95	8.72	490	50
42		2407	24		3.65	7.16	490	20
06A	6-22	0450	23.5		2.90	6.24	490	490
20A		0920	23		2.68	6.51		
28A		2237	25		4.40	8.16		
42A		1919	24.5		8.52	7.62		
06B	6-23	0015	-		3.18	6.50		
20B		0545	23		2.48	6.19		
Station S-6 Middle River - Bridge Va. 256 - West of Grottoes								
67062611	6-21	-	24		4.22	6.21	330	170
33		1015	23		4.70	6.85	1720	790
11A	6-22	0625	23		7.67	5.85	1300	330
33A		1612	25		4.32	7.30		
11B	6-23	0155	-		2.74	6.07		

Sample Number	Date Sample Taken	Time Sample Taken	Temp °C	Flow CFS	BOD mg/l	DO mg/l	Coliform MPN	Fecal Coliform MPN
Station S-6A Middle River - Bridge Va. 668 - West of Grottoes								
67062610	6-21	-	24	102	7.87	7.45	790	230
32		2115	24.5		3.12	6.81	490	170
10A	6-22	0615	22.5	103	3.80	6.29	490	330
32A		1600	25		3.82	7.78		
10B	6-23	0145	-	132	3.56	6.36		
Station S-8 Grassy Creek - Bridge Rt. 867 - East of Mt. Crawford								
67062614	6-21	-	24		LA	2.71	LA	LA
36		1045	25.5		13.62	2.12	34,800	94
14A	6-22	0707	23		14.20	1.76	>160,900	1700
36A		1645	26		13.60	3.21		
14B	6-23	0230	-		13.76	1.33		
Station S-9 North River - Bridge U.S. 11 - South of Mt. Crawford								
67062613	6-21	-	21		LA	7.69	LA	LA
35		1040	22.5		5.46	7.21	160,900	4600
13A	6-22	0648	22		4.32	5.73	91,800	2100
35A		1640	23		3.87	8.24		
13B	6-23	0222	-		1.94	5.92		
Station S-9B North River - Bridge U.S. 276 - Rockland Mill								
67062612	6-21	-	23		4.59	7.21	1400	210
34		2145	23		3.85	7.95	490	130
12A	6-22	0635	23		4.55	7.16	1720	170
34A		1625	24		4.55	6.96		
12B	6-23	0207	-		2.56	7.45		

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Sample Number	Date Sample Taken	Time Sample Taken	Temp °C	Flow CFS	BOD mg/l	DO mg/l	Coliform MPN	Fecal Coliform MPN
		Station S-10 South Fork - Bridge Rt. 659 - off U.S. 340						
67062604	6-21	-	24	307	4.25	6.84	330	230
18		1340	25		5.37	7.31	1090	330
26		1820	25		6.40	7.94	200	230
41		2345	25		4.01	8.59	490	170
04A	6-22	0435	24	303	3.84	7.51	34,800	2100
18A		0905	24.5		2.94	6.93		
26A		1420	25		6.09	7.41		
40A		1907	24		7.41	7.38		
04B	6-23	0026	-	347	3.92	7.39		
18B		0530	24		3.19	6.76		
		Station S-11 South Fork - Bridge Rt. 649 - off U.S. 340						
67062603	6-21	-	21		4.05	7.57	1300	270
17		1320	25		3.85	9.59	340	20
25		1805	25		2.53	9.52	80	50
39		2320	24		2.35	7.22	130	20
03A	6-22	0420	23		2.60	6.77	330	80
17A		0855	22		2.28	7.67		
25A		1405	24		5.34	8.73		
39A		1855	25		3.04	7.68		
03B	6-23	2350	-		5.21	6.90		
17B		0415	22		2.73	6.65		

Sample Number	Date Sample Taken	Time Sample Taken	Temp °C	Flow CFS	BOD mg/l	DO mg/l	Coliform MPN	Fecal Coliform MPN
		Station S-12 South Fork - Bridge U.S. 33 - West of Elkton						
67062601	6-21	-	22		12.14	4.50	2400	700
15		1245	27		6.72	6.89	1400	490
23		1705	26.5		10.74	15.86	54,200	5400
37		2235	25		15.98	5.59	2400	790
01A	6-22	0340	24		5.76	5.27	24,000	2780
15A		0815	22.5		LA	10.12		
23A		1330	26		16.22	6.63		
37A		1828	24		15.66	5.43		
01B	6-23	2310	-		7.72	10.47		
15B		0445	23		6.06	4.91		
		Station S-13 South Fork - Bridge Rt. 602 - West of Shenandoah						
67062602	6-21	-	23		6.40	7.15	270	80
16		1258	26		8.68	7.71	940	90
24		1735	25.5		3.76	10.66	460	80
38		2300	24		6.62	9.03	1300	80
02A	6-22	0355	23.5		4.50	7.60	1720	140
16A		0830	24		4.32	6.80		
24A		1340	26		7.80	7.94		
38A		1838	25		9.40	7.65		
02B	6-23	2330	-		8.18	6.63		
16B		0500	23		4.52	6.74		

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Sample Number	Date Sample Taken	Time Sample Taken	Temp °C	Flow CFS	BOD mg/l	DO mg/l	Coliform MPN	Fecal Coliform MPN
		Station S-19 South Fork - Bridge Luray Ave. - Front Royal						
67061407	6-14	0640	24	550	5.34	5.28	490	<20
16		1240	26		6.41	9.18	330	<20
26		1750	28		9.72	14.04	330	<20
37		2250	26		11.15	8.77	700	<200
1501	6-15	0355	23	531	6.21	5.47	490	130
11		0913	25.5		7.60	5.92		
20		1340	28.5		9.97	10.18		
30		1915	29		12.20	12.05		
1601	6-16	0015	27	539	8.65	6.94		
11		0455	25		6.65	4.77		
		Station S-20 South Fork - Bridge U.S. 340 - Front Royal						
67061408	6-14	0700	24.5		8.48	5.05	1090	20
17		1415	28		10.52	10.61	230	<20
27		1810	27		11.86	12.84	790	<20
38		2310	26		11.12	6.48	500	<200
1502	6-15	0515	24		8.73	5.16	230	<20
12		1020	27		8.99	8.07		
21		1355	29		9.99	10.51		
31		1930	29		11.61	10.03		
1602	6-16	0110	26		9.06	6.18		
12		0552	25		7.54	4.93		

Sample Number	Date Sample Taken	Time Sample Taken	Temp °C	Flow CFS	BOD mg/l	DO mg/l	Coliform MPN	Fecal Coliform MPN
		Station N-1 North Fork - Bridge Va. 259 - Cootes store						
67063001	6-28	0910	20.5	26	2.46	8.36	2600	LA
10		1255	22		2.84	9.36	130	LA
19		1800	22		3.93	9.47	542	330
28		1055	21		6.01	8.13	22,100	<210
37	6-29	0325	20.5	23	2.24	7.53	630	460
46		0840	20.5		2.20	7.63		
55		1335	22		9.93	9.38		
64		1855	21.5		2.12	9.10		
73		1140	21		4.11	8.02		
82	6-30	0433	21	21	4.49	7.53		
		Station N-1A North Fork - Bridge Va. 259 - Broadway						
67063002	6-28	0920	21		4.90	8.57	3480	LA
11		1305	22		2.96	9.75	3480	20
20		1745	23		6.14	9.80	7900	220
29		1110	20		6.28	7.89	5420	170
38	6-29	0335	20.5		2.00	7.29	3480	790
47		0845	20		2.48	7.59		
56		1337	23		8.86	9.79		
65		1902	22		3.16	9.44		
74		1145	21.5		4.02	7.63		
83	6-30	0441	21.5		3.78	7.14		

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Sample Number	Date Sample Taken	Time Sample Taken	Temp °C	Flow CFS	BOD mg/l	DO mg/l	Coliform MPN	Fecal Coliform MPN
		Station N-2 North Fork - Bridge Va. 42 - Timberland						
67063003	6-28	0935	22		8.90	4.39	34,000	75
12		1315	22.5		6.64	5.01	91,800	2000
21		1810	23		12.94	5.05	54,200	17,200
30		1120	21.5		9.46	3.17	>160,900	91,800
39	6-29	0345	20.5		7.72	3.39	91,800	34,800
48		0852	20		6.30	3.32		
57		1355	23		8.80	4.96		
66		1911	23.5		6.08	3.60		
75		1155	22		6.98	3.07		
84	6-30	0452	21.5		6.78	2.37		
		Station N-2A North Fork - Bridge Va. 260 - New Market						
67063004	6-28	1000	21		5.94	8.64	110	LA
13		1330	22.5		2.22	11.03	2400	LA
22		1830	23		1.84	9.95	4900	330
31		1140	22		6.80	6.85	91,800	9180
40		0400	20		4.80	5.90	24,000	9180
49	6-29	0900	19		4.14	6.71		
58		1410	21.5		6.00	11.15		
67		1920	22		2.44	10.02		
76		0007	22		2.70	6.73		
85	6-30	0507	21		4.42	5.61		

LA Laboratory Accident

Sample Number	Date Sample Taken	Time Sample Taken	Temp °C	Flow CFS	BOD mg/l	DO mg/l	Coliform MPN	Fecal Coliform MPN
		Station N-2B Smith Creek - Bridge off U.S. 11						
67063006	6-28	1035	20.5		3.49	7.17	4900	200
15		1355	21		1.90	7.70	5420	3480
24		1850	21		2.56	8.16	14,100	5420
33		1210	20.5		4.19	7.71	4700	90
42	6-29	0425	19.5		3.72	7.35	1300	1300
51		0922	19.5		3.07	6.89		
60		1435	21		5.31	7.76		
69		1940	20.5		2.37	7.99		
78		0040	21.5		3.65	7.54		
87	6-30	0530	20.5		2.50	7.12		
		Station N-3 Bridge Rt. 767 - East of Quicksburg						
67063005	6-28	1022	21.5		2.82	7.12	94	20
14		1345	22.5		2.59	8.73	1090	LA
23		1840	23		3.64	8.80	54,200	2400
32		1155	21		6.33	7.96	810	330
41	6-29	0412	21		3.49	7.27	5420	5420
50		0912	21		5.25	6.26		
59		1425	22		5.38	8.58		
68		1930	21.5		2.41	8.12		
77		0020	23		3.27	7.53		
86	6-30	0520	21		6.48	6.97		

LA Laboratory Accident

Sample Number	Date Sample Taken	Time Sample Taken	Temp °C	Flow CFS	BOD mg/l	DO mg/l	Coliform MPN	Fecal Coliform MPN
		Station N-3A Stony River - Bridge U.S. 11 - Edinburg						
67063008	6-28	1105	19		3.35	9.59	20	<20
17		1420	21		1.83	10.00	54,200	17,200
26		1915	21		3.71	9.43	27,800	5400
35		1240	19		4.47	7.68	21,000	50
44	6-29	0450	18.5		2.63	7.52	3480	LA
53		0945	18		5.62	8.15		
62		1500	20		2.32	10.48		
71		2004	20.5		2.64	9.51		
80		0115	21		2.81	7.54		
89	6-30	0553	19		1.67	7.37		
		Station N-3B North Fork - Bridge 2 miles below Edinburg						
67063007	6-28	1055	21.5		5.36	7.14	34,800	LA
16		1410	22.5		4.10	9.05	16,090	1750
25		1905	23		2.61	10.12	24,000	1300
34		1230	21		6.64	7.95	17,500	140
43	6-29	0440	20.5		3.23	6.94	10,900	LA
52		0935	21		6.54	6.51		
61		1450	22		2.85	9.62		
70		1955	22.5		2.43	10.86		
79		0105	22.5		3.42	7.95		
88	6-30	0543	21.5		5.52	6.57		

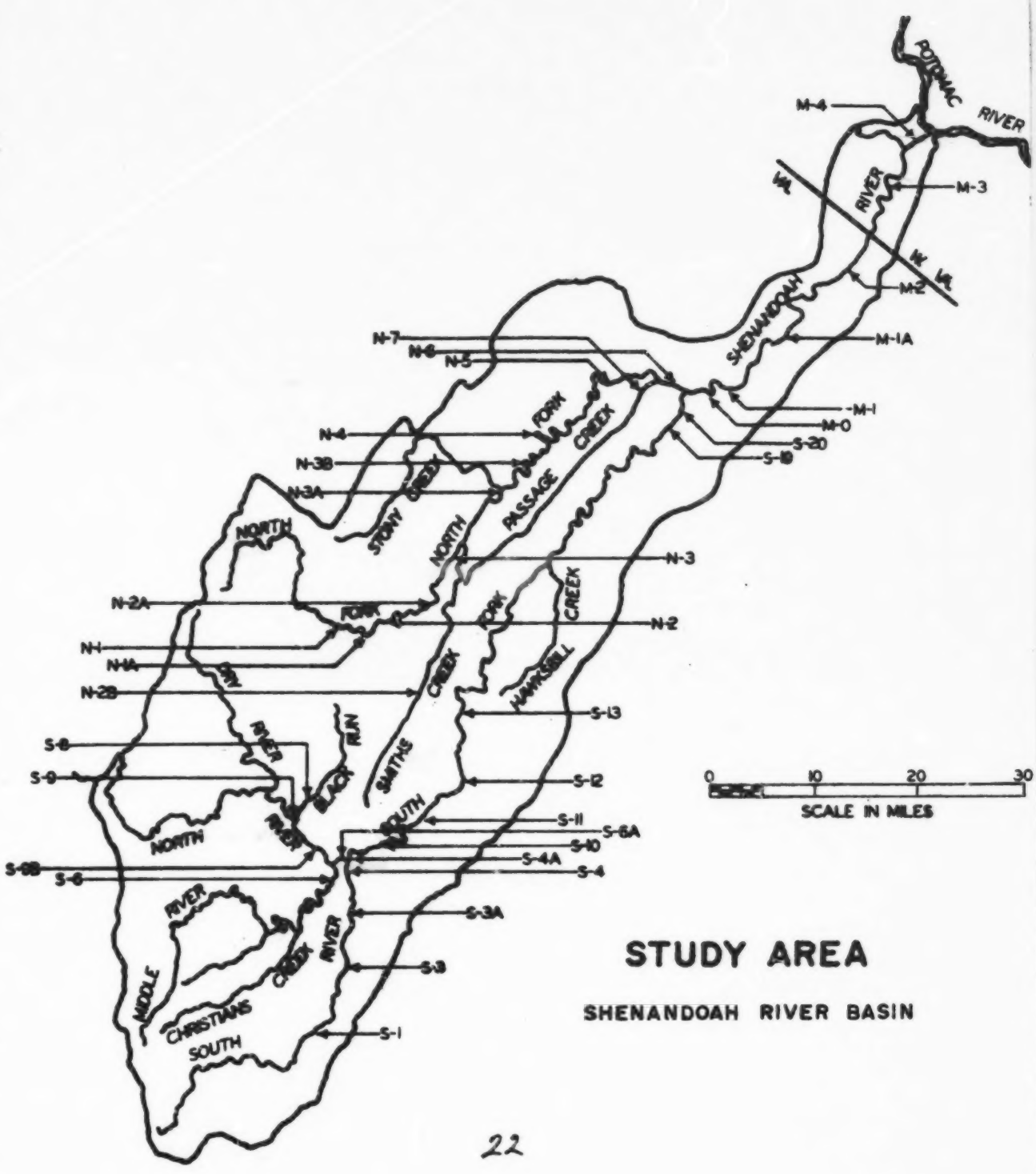
LA Laboratory Accident

SHENANDOAH RIVER SURVEY (Continued)

Sample Number	Date Sample Taken	Time Sample Taken	Temp °C	Flow CFS	BOD mg/l	DO mg/l	Coliform MPN	Fecal Coliform MPN
		Station N-4 North Fork - Bridge Rt. 663 - Northeast of Woodstock						
67063009	6-28	1135	23		4.68	6.52	130	
18		1440	23		2.23	8.04	<20	LA
27		1935	23		3.48	10.61	22,100	LA
36		0100	23		4.34	10.39	9180	550
45	6-29	0510	22		2.29	7.72	7000	60
54		1000	21		3.98	6.38		LA
63		1520	22		3.85	7.86		
72		2025	22.5		2.06	10.82		
81		0130	24		3.04	10.16		
90	6-30	0609	22.5		1.39	7.42		
		Station N-5 North Fork - Bridge Va. 55 - East of Strasburg						
67061411	6-14	0740	24.5	187	3.58	4.93	1300	<20
19		1437	27		5.28	11.40	490	<20
30		1850	26		6.25	12.45	9180	<20
40		2350	25		8.05	7.76	24,000	490
1505	6-15	0539	24	175	4.26	5.20	7900	<200
14		1037	25		5.28	8.28		
24		1430	28		8.44	12.55		
33		2000	27		7.45	10.47		
1605	6-16	0135	26	170	6.60	6.50		
14		0608	25		4.97	4.63		

LA Laboratory Accident

Sample Number	Date Sample Taken	Time Sample Taken	Temp °C	Flow CFS	BOD mg/l	DO mg/l	Coliform MPN	Fecal Coliform MPN
		Station N-6 North Fork - Bridge U.S. 340 - Front Royal						
67061409	6-14	0715	25		5.29	7.07	140	<20
18		1405	25		7.22	8.29	700	<20
28		1815	26.5		11.33	11.57	230	<20
39		2320	26		10.20	12.60	200	<200
1503	6-15	0505	24		6.39	9.38	790	80
13		1010	27		5.13	7.61		
22		1405	28.5		9.88	9.63		
32		1940	28		9.51	14.42		
1603	6-16	0105	27		7.64	11.46		
13		0545	26		4.39	9.09		
		Station N-7 Passage Creek - Bridge Va. 55						
67061410	6-14	0730	26		3.58	7.91	1090	20
29		1830	26		3.91	8.17	13,000	<200
1504	6-15	0525	20		4.08	8.05	460	<20
23		1415	26		5.06	8.28		
1604	6-16	0123	23		9.51	7.13		



STUDY AREA

SHENANDOAH RIVER BASIN

FIGURE 1